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NOTES ON NORTH AMERICAN SPHAGNUM, III

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The Subgenus Inophloea Russow (concluded)

S. erythrocalyx collected by Underwood in the vicinity of Cinchona in Jamaica, one of which (no. 160) was named by Warnstorf *S. medium* Limpr. and evidently forms the basis of Warnstorf's assignment of this species to Jamaica,[1] but *S. medium* Limpr. is not found in the West Indies. The second (no. A) Warnstorf named *S. meridense* var. *versicolor*[2] and still refers to this species.[3]

With these reductions and corrections the distribution of *S. erythrocalyx* is largely indicated. Its most northerly stations are in New Jersey, where it was collected by D. C. Eaton at Quaker Bridge and Pleasant Mills and distributed in Sphagna boreali-americana exsiccata (Eaton & Faxon) as nos 171 and 172. From there southward it is found along our Atlantic and Gulf coasts to Louisiana and throughout the West Indies, where it is the prevailing species of *Inophloea*, in fact the only one yet found except *S. portoricense* and *S. imbricatum*. The locality in British Honduras (leg. F. M. Hunt, 1910) is the only one from Mexico and Central America and similarly in South America it seems primarily a species of the eastern part of the continent, being remarkably abundant in Brazil. Within the range indicated it may be sought in relatively small, compact plants with short branches, showing, if pigmented, a reddish or purplish brown color, which may even be quite dark. The plants are dioicous and rarely found with fruit.

7. *Sphagnum magellanicum* Bridel, 1798. In restoring this venerable and eminently fit name I realize that I stamp myself as a "fanatique de priorité,"[4] but the discovery by Camus of the identity of Bridel's species seems to me a great gain in view of the considerable synonymy of the species prior to Limpricht's rediscovery of it and of the difficulties naturally associated with old names, which can not always be solved so simply. Nor can I see that Limpricht's credit for having "appreciated" this species[5] is one whit diminished by

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[1] Zur Kenntnis der Subsecundum-und Cymbifoliumgruppe 123ff. 1894.

[2] L. c. 111. 1911.

[3] L. c. 489. 1911.

[4] *Cf.* Cardot, Répertoire sphagnologique 327. 1896. The re-echo of Cardot's anathema by Warnstorf (Kryptogamenflora der Mark Brandenburg I: 338. 1903.) is interesting in view e. g., of Warnstorf's acceptance just four pages before (334) of *S. subbicolor* Hampe, 1880, instead of *S. centrale* Jensen, 1896. I had supposed that priority was a generally accepted nomenclatorial principle. If it be necessary that a first description furnish the ultimately distinctive character of a species one can not but wonder what species of mosses would retain their names, and who is to pass judgment as to the adequacy of a description. Compare also the very pertinent remarks of Lindberg (Europas och Nord Amerikas Hvitmossor, p. 41f.) *à propos* of *S. compactum*.

[5] Bot. Centralbl. 7: 313. 1881.

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calling it *S. magellanicum* Bridel. Limpricht got his diagnostic characters from the leaf-section, noting that the chlorophyll cells were central and quite included by the hyaline ones, which is its most conspicuous feature. For its other characters we must turn again to Russow.[1] The pigmentation, a clear purplish red, is unique for *Inophloea*, but the plants may be green or even brownish. The cortical cells of stem show fibrils and one or two good sized pores per cell. The stem leaves are very long and narrow for *Inophloea*, often twice as long as wide, and while normally without fibrils have their hyaline cells practically never divided. The branch leaves are usually short in comparison with width, often nearly orbicular, their hyaline cells are small and narrow, especially as compared with those of the last species, with fewer thin fibril-bands. The pores on their outer surface are conspicuous because the cell-walls are here not at all or only slightly convex. In section this lack of convexity of walls of hyaline cells on either surface is striking, giving with the small eld liptical included chlorophyll cells an unmistakable clue to the plant's identity. Unfortunately this character is somewhat variable, as Russow recognized an- Schliephacke had already noted,[2] so that mutually approaching forms of this species and *S. palustre* have caused a deal of trouble.[3] This trouble has been increased rather than diminished by the attempt to intercalate a species between the two. The attempt finds its present expression in Warnstorf's *S. subbicolor* Hampe, the stumbling-block of anyone who seriously attempts to secure an understanding of this group of *Sphagnum*. Hampe seems not to have foreseen just what the characters of his species would prove to be and the trouble begins in 1887 with Russow's *S. palustre* subsp. *intermedium*,[4] which remained a *nomen nudum* until Warnstorf[5] made it a variety of *S. papillosum*, having in mind the forms of the latter species with reduced or rather entirely lacking papillæ. Russow showed in 1894[6] that his plant was not immediately related to *S. papillosum* and characterized it at length as *S. intermedium* Russow. A previously existing *S. intermedium* Hoffmann rendered the name objectionable, so in 1896 Jensen[7] rechristened it *S. centrale* Jensen. Limpricht in 1901[8] suggested the identity of *S. subbicolor* Hampe, 1880 with such forms and this last name has accordingly since been used by Warnstorf. Limpricht himself took little stock in the species, speaking of it as a second or third class one, which is. I take it, equivalent to none at all. He also speaks of it as being a conglomerate of aberrant forms of the three species: *S. cymbifolium, S. medium, S. papillosum* which is true of the last only in so far that forms of *S. papillosum* with weak or no papillæ might very easily be confused with it. That it combines forms of *S. palustre* (*S. cymbifolium*) and of *S. magellanicum* (*S. medium*) is the conclusion which I have also reached and appears to coincide with Russow's original conception (1887) of the relation between these two species.[1] Apart from the fact that Russow's detailed description of *S. intermedium* includes no features that do not belong to the one or the other of the two species in question one need but consult Warnstorf's figures[2] of leaf-sections of the Europea species of *Inophloea* to be convinced of the real nature of his *S. sublicolor* Hampe. In his figure 3 are given three sections (a, b, c) of branch-leaves of *S. subbicolor*, which may be compared with those preceding of *S. cymbifolium* (fig. 2a, b, c, d, e) and those following of *S. papillosum* (fig. 4a, b) and *S. medium* (fig. 5). Certainly nothing but extreme "Haarspalterei" can make any distinction between 3a and the various forms of 2, nor is there a much greater difference between 3c and 5, while that between 3a and 3c is infinitely greater than either. My conclusion then is, and all the facts that I have observed seem to confirm it, that *S. subbicolor* as understood by Warnstorf is an artificial pecies, attempting to embrace intergrading or apparently intergrading forms of two very closely related species. The conception implied in Jensen's name, *S. centrale*, applies rather to the aberrant forms of *S. magellanicum*, which species alone of *Inophloea* Jensen found in the station from which he first recorded *S. centrale*. Such variation of *S. magellanicum* involves only a slight thickening of its cell walls at their junction. In the summer of 1904 I had the pleasure of meeting Herr Warnstorf in Neu-Ruppin and expressed to him on that occasion my inability to form any satisfactory conception of *S. subbicolor*. He very kindly gave me a local specimen for comparison, but this specimen agrees so closely with *S. magellanicum* that one can refer it to it without a qualm of conscience, in fact I do not see how one can well dispose of it otherwise. With careful study of their aggregate characters I think these forms can in all cases be referred satisfactorily to one or the other of the two species and that the two (*S. palustre* and *S. magellanicum*) are specifically sufficiently distinct. Facts of distribution would tend to confirm this conclusion, e. g., the fact that *S. magellanicum* is widely distributed in South America, where *S. palustre* (and it may be added, *S. subbicolor*) does not occur.

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[1] *S. meridense* belongs to the group *Acutifolia*!

[2] Die Torfmoose der thüringischen Flora 10f. 1882.

[3] *Cf.* especially Dusén, Om Sphagnaceernas Utbredning 10. 1887; also Russow, Zur Anatomie der Torfmoose 32. 1887.

[4] Über den gegenwürtigen Stand seiner Studien 312. 1887.

[5] Hedwigia **30**: 160. 1891.

[6] L. c. 108 ff.

[7] Bihang till kgl. sv. Akad. Handl, 21. III: No. 10: 34.

[8] Kryptogamenflora, Laubmoose **3**: 605f. *Cf.* C. Jensen, Musci Asiæ borealis, **3**: 6. 1909. Jensen takes it that Limpricht had not seen Hampe's specimen. I do not know that there is any reason to distrust Braithwaite's identification of *S. subbicolor* with *S. papillosum* (Journal of Botany **19**: 116. 1881). He stated he had received an authentic specimen from Rehmann.

S. pseudomedium Warnstorf, 1891, originally accredited to Central America, its author has now ascertained[3] to have come from Australia or New Zealand or thereabouts, where *S. magellanicum* also occurs.

Our species is widely distributed in North America: from Labrador southward to Florida and Alabama, in Michigan and Minnesota, from California northward to Alaska. It is entirely lacking in the West Indies, but occurs in Bermuda, where it is the only species of *Inophloea.* It has not yet been found in Mexico or Central America, though in South America it is a characteristic and abundant species of the whole Andean region to Cape Horn, being the only species of *Inophloea* in the region of the Magellan Straits. It is also of wide distribution in Europe, Asia and Australia, in fact by far the most widely distributed species of *Inophloea.* Its characters are also uniform throughout it range, apart from the tendency to vary in the direction of *S. palustre.* Within its North American range it may be sought under a variety of conditions and will best be recognized in the field by its purplish red pigmentation. It is dioicous, but occurs frequently with fruit.

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[1] *Cf.* also Loeske, Zur Morphologie und Systematik der Laubmoose 46. 1910.

[2] Kryptogamenflora der Mark Brandenburg **1:** 343. 1903.

[3] Pflanzenreich **51:** 486. 1911.

To what has been said of the individual species of *Inophloea* there may be added that the corrugated condition of the inner walls of the cortical cells where these overly the wood-cylinder as described for *S. imbricatum* and *S. portoricense* is entirely analogous to the "fringe-fibrils" of the inner walls of the hyaline cells of the leaves where these overly the chlorophyll cells and that the two are evidently merely different phases of one and the same phenomenon; further that I was able to confirm Austin's statements about the habitat of *S. portoricense* by observations made during a short stay at Island Heights in New Jersey in the early part of August 1911. In the shallow pond just southeast of the Pennsylvania Railroad station at Toms River *S. portoricense* may be found in abundance, submerged entirely or with the tops of the plants just reaching the surface of the water. No *S. imbricatum* was noted in this locality, nor was there any suggestion of forms varying in the direction of that species. The water in which the plants grew was tepid or distinctly warm to the hand and abundance of bog-iron ore accounts, at least in part, for the dark color the plants usually show. Associated with the species were *S. cyclophyllum* and *S. Pylaesii* with occasional *S. subsecundum.* With these conditions so favorable for southern species the narrow border of cranberry-bog (*Vaccinium macrocarpon*) offered a decided contrast, the prevailing species being here *S. pulchrum,* which finds its southern limit in New Jersey, and *S. magellanicum,* a tuft of *S. papillosum* being also found. It was here an easy matter to stand with one foot in boreal and the other (wetter one) in subtropical Sphagnum. With what has been said about this pond the reader may compare Austin's description[1] of conditions in Manchester (now Lakehurst), N. J. and be assured that watercourses in the pine-barrens of New Jersey constitute one of the best localities for Sphagnum in North America.

Phylogenetically the order of species in *Inophloea* should be the reverse of that in the above notes. The reasons for regarding *S. magellanicum* and the collective *S. papillosum* and *S. erythrocalyx* as heading the line of development are, apart from their much broader distribution, certain anatomical features. In the first place the central position of chlorophyll cells in leaf-section appears to be a primitive condition in *Sphagnum* generally, as shown by the morphologic fact that in immature condition all *Sphagnum* leaves are thus characterized.[1] For the mature leaves the feature occurs in some species of all groups of the genus, either as the normal condition of the group or as that of the first phylogenetic species or rarely perhaps as a tendency of reversion. Furthermore in the lesser number of fibrils in cortical cells and of pores in outer cells of stem, as well as of pseudostomata in the wall of the capsule these species approach more closely those of the other subgenus. My conception of the phylogenetic relations of our species of *Inophloea* could be expressed by the following diagram:

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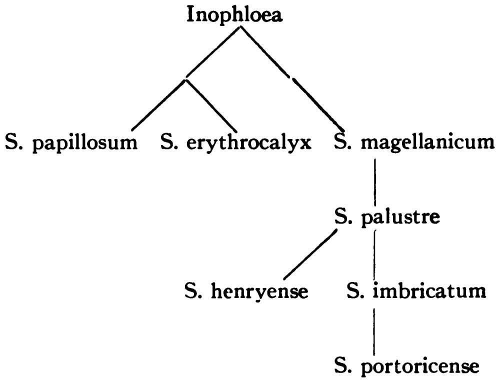
[1] Amer. Journn. of Science and Arts (Silliman's Journal), 2nd ser. **35**: 252ff. 1863.



My reason for putting *Inophloea* before the two sections of *Litophloea* is the conviction that it is relatively nearer the primitive type of Sphagnum, as shown by its leaf structure without differential margin, the less differentiated branch-cortex, etc. Even the fact that the cortical cells are fibrillose argues for a more primitive condition of things, as these cells are quite analogous to the hyaline cells of the leaves, which are normally fibrillose in all the groups. Warnstorf has reversed this natural order in his treatment in Pflanzenreich without giving any reasons for doing so. He had in Die natürlichen Pflanzenfamilien (1900) followed an order with which my own is in essential agreement. The species of *Inophloea* seem also to be relatively older in their separation from each other than those of some of the other groups, notably of the *Acutifolia*, whose macroscopic differences, though encouraging in the field, are more truly varietal in their nature.

ITHACA, N. Y.

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[1] *Cf.* Russow, Zur Anatomie der Torfmoose, 21. Russow's observations (Zur Kenntnis der Subsecundum- und Cymbifoliumgruppe 124) on the chlorophyll cells of the leaves of pendent branches I am unable to confirm, nor do I find otherwise any clear characters of reversion in these branches or their leaves.